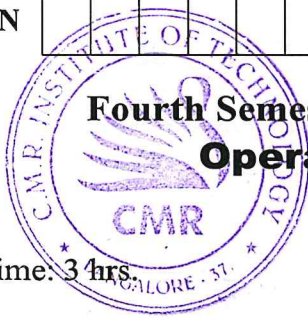


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Fourth Semester B.E. Degree Examination, July/August 2021 Operational Amplifiers and Linear ICs

Time: 3 hrs.

Max. Marks: 100

Note:1. Answer any FIVE full questions.
2. Any missing data may be assumed suitably.

- 1
 - a. What is an op-amp? Explain the block diagram representation of a typical op-amp. (08 Marks)
 - b. Define the following electrical parameter as,
 - (i) Input offset voltage
 - (ii) CMRR
 - (iii) Slew rate. (06 Marks)
 - c. Briefly explain the difference between the dc and ac amplifier with a suitable circuit. (06 Marks)
- 2
 - a. What are the characteristics of an ideal op-amp? (04 Marks)
 - b. What is an instrumentation amplifier? Explain the instrumental amplifier using transducer bridge resistance. Obtain the output voltage in terms of changing in resistance of the transducer. (10 Marks)
 - c. Explain the summing amplifier in any mode operation. Show that output voltage of a summing is equal to $\frac{1}{3}$ rd of all input voltages. (06 Marks)
- 3
 - a. Define an active filters. Explain the first order low pass butter worth filter with a frequency response. (06 Marks)
 - b. Design a single stage band pass filter to have unity voltage gain and a pass band from 300 Hz to 30 Hz. (08 Marks)
 - c. Explain the following terms referred to the voltage regulator (i) line regulation (ii) Load regulation and Ripple rejection. (06 Marks)
- 4
 - a. What are the advantages of an active filter over passive filter? (04 Marks)
 - b. Sketch the circuit of a voltage follower regulator using op-amps. Explain the circuit operation. (08 Marks)
 - c. Using LM317 ICs, design an adjustable voltage regulator to satisfy the following specifications:
Output voltage $V_0 = 5$ to 12 volt
Input current $I_0 = 1.0$ Amp
(Assume $I_{ADJ} = 100 \mu A$, $V_{ref} = 1.25$ volt) (08 Marks)
- 5
 - a. Sketch the circuit of a triangular / rectangular waveform generator. Draw the output waveforms and explain the circuit operation. (08 Marks)
 - b. Design a phase shift oscillator to have an output of 3.5 KHz. Use 741 IC op-amp with supply voltage of $\pm 12V$. (07 Marks)
 - c. Draw the circuit diagram for an op-amp inverting zero cross detector with waveforms and explain its operation. (05 Marks)

- 6 a. Use a 741 IC op-amp, design an inverting Schmitt trigger circuit to trigger at $\pm 2V$ input and produce a $\pm 11 V$ output. (08 Marks)
- b. Draw and explain the working voltage to current converter with grounded load. (06 Marks)
- c. Draw a neat diagram and explain the operation of an inverting Schmitt trigger circuit. Draw its hysteresis curve. (06 Marks)
- 7 a. Design a nonsaturating precision half wave rectifier to produce a 2 V peak output from a 1 MHz sine wave input a 0.5 V peak value. Use a bipolar op-amp with a supply voltage of $\pm 15V$. (06 Marks)
- b. With a neat circuit diagram, explain precision full wave rectifier as combination of a summing circuit and half wave rectifier. Draw the input and output waveform. (08 Marks)
- c. Draw the block diagram and waveform for a linear ramp type ADC. Explain its operation with waveforms. (06 Marks)
- 8 a. Discuss the advantage of a precision rectifier over an ordinary diode rectifier. (04 Marks)
- b. With a neat circuit diagram, explain the working of 3 bit R-2R DAC. Draw a output versus inputs. (08 Marks)
- c. Draw a neat block diagram of the successive-approximation type ADC. (08 Marks)
- 9 a. Draw the block diagram and waveform for a PLL (Phase-Locked Loop) system. Explain its function. (06 Marks)
- b. Draw and explain the functional block diagram of a 555 timer for each component parts. (08 Marks)
- c. Briefly explain the roles of a low pass filter and VCO in PLLs. (06 Marks)
- 10 a. Using the 555 timer, design a monostable multivibrator an output pulse width of 100 ms. (08 Marks)
- b. Explain the working of the monostable multivibrator as a pulse stretcher using 555 ICs. (06 Marks)
- c. Write a short notes on : (i) Phase detector (ii) PLL performance factors. (06 Marks)

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